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Detection Sensitivities in 3-8 MeV Neutron Activation

Neutron activation analysis is currently being used to identify certain elements that are difficult to isolate and identify in chemical systems. A sample of unknown material is activated with neutrons and the resulting γ -ray emission spectra is used to identify the material.

A study has been conducted to determine the relative detection sensitivities of 73 of the elements (all the radioactively stable elements except beryllium, lutetium, osmium, and the noble gases) using the fast, unmoderated neutrons from an Am²⁴¹-Cm²⁴²-Be source.

The experiments were carried out for three combinations of irradiation, cooling, and counting conditions for the purpose of differentiating the product nuclides on the basis of half-lives. The three conditions were: 1) 5 min. irradiation, 6 sec. cooling, 2 min. counting; 2) 5 min. irradiation, 4.9 min. cooling, 20 min. counting; and 3) 1 hour irradiation, 1 hour cooling, 40 min. counting.

The induced spectra were measured by a 10 cm diameter by 10 cm long NaI(Tl) crystal. A high output isotopic neutron source was used because it is mobile, requires little maintenance, has a small flux gradient, and has a neutron flux of 3-8 MeV neutrons.

The relative standard deviation of a typical series of measurements was 0.92%.

Notes:

1. The study has been reported in ANL-7242, "Detection Sensitivities in Nuclear Activation with an Isotopic Neutron Source (with a collection of γ -ray spectra)," by J. Wing and M. Wahlgren, Chemistry Division, Argonne National Laboratory, August, 1966. The report is available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151; price \$3.00 (microfiche, \$0.65).
2. Inquiries concerning this innovation may be directed to:

Office of Industrial Cooperation
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
Reference: B68-10298

Source: J. Wing and M. A. Wahlgren
Chemistry Division
(ARG-10210)

Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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Category 02

